Biochemistry Lecture 4

الدهون
Lipids: - are organic compound which are related to fatty acids and insoluble in water, but soluble in fat solvents.

Hydro Carbon
- هي عنية (بالهيدروكربون) وبتالي هي لا تتذوب بالماء

الأهمية
Medical Importance of lipids:

1- lipid acts as energy storage (1 gm of lipids gives 9kcal or 9 cal) مخزن للطاقة

2- Cholesterol is a type of lipid, responsible for كلسترول نوع من الدهون مسؤول عن
   - production of hormones
   - Vitamin D
   - Bile acid.

3- Integral part of cell membrane. يدخل في تكوين الغشاء الخلوي

4- Important in absorption of Fat Soluble Vitamins. له دور في إمتصاص الفيتامينات الذائبة في الدهون

LL> AKED
Fat soluble vitamins

5- provide insulation to the body from cold. حماية من البرد والصدمات.
   and protect organs from Shock.

Classification of lipids:

هي دهون بسيطة ١- لأنه يعطي دهن فقط
① Simple lipids (Acylglycerols, waxes.)

اي تكون (دهن + شي آخر) مركب
② Compound lipids (phospholipids, Glycolipids, lipoproteins).
دهن + فوسفات دهن + كربوهيدرات بروتين + دهن

مشتقة من ① و ②
③ Derived lipids (fatty acid, Fat Soluble Vitamins, Steroids, ketone bodies)

(حفظ التقسيم مع مثال)

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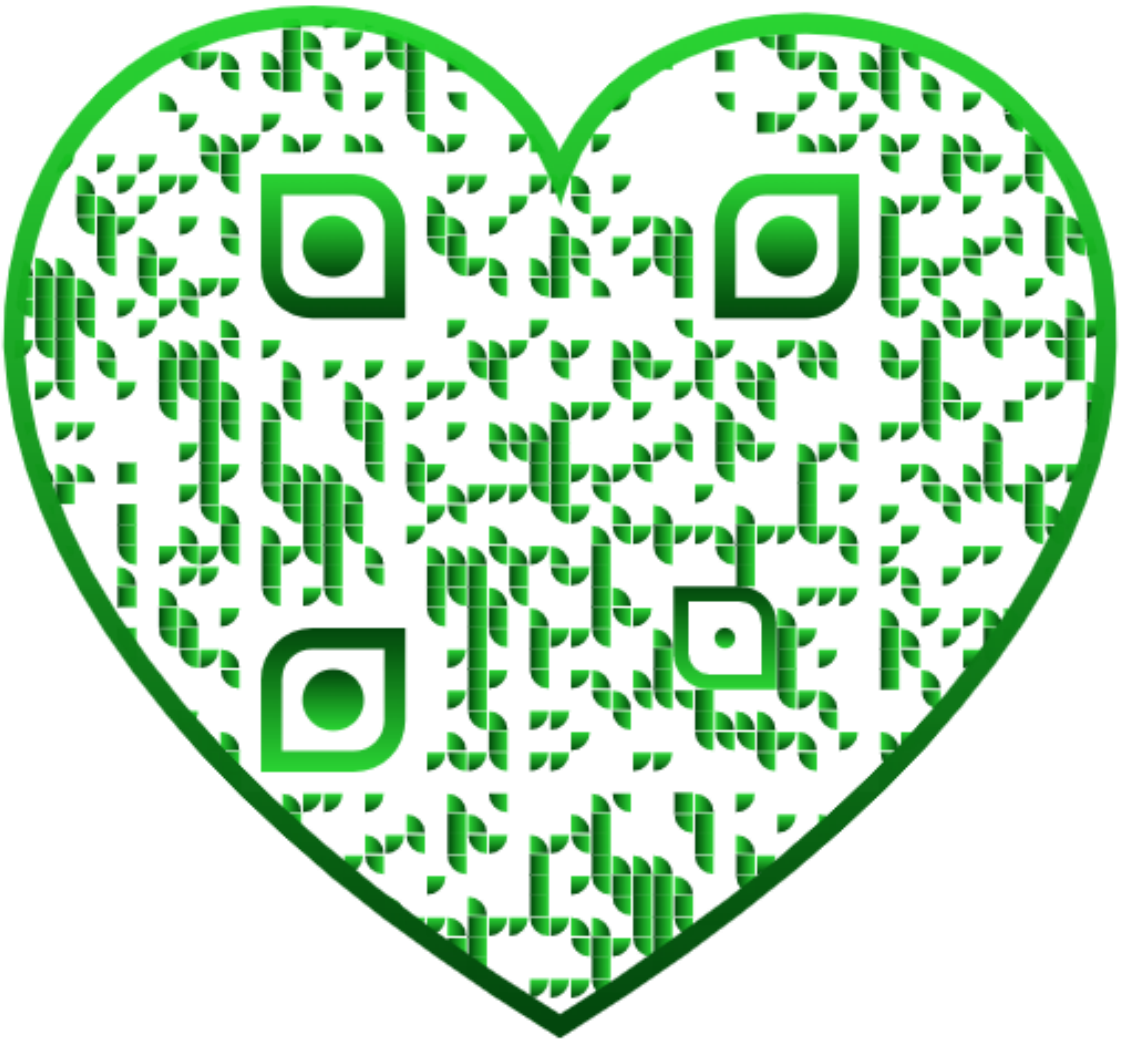

تعريف

1- Simple lipids : (مركبات دهنية مرتبطة بالكحول)

Are esters of fattyacids with various alcohols.

أنواعه

Two types of Simple lipids.

① **Acylglycerols** :- => Have 3 types : (① Monoacylglycerols, ② Diacylglycerl, ③ Triacylglyce
- واكثر تتر شيوعاً واستخداماً هي (triacylglycerols) والاسم الأخر لها هو «triglyceride»
وتمثل 90٪ من الخليط والطعام والزيوت.

*=> **Triacylglycerols:** are esters of three fatty acids with glycerols.

=> Triglycerides which are solid at room temp. are (fats)
= (Contain Saturated fatty acids).

=> Triglycerides which are liquid at room temp. are (Oil)
= (Contain unsaturated fatty acid).

وظيفتها

Functions :- 1- They are major Storage form of energy. (تخزن طاقة بكميات لأيام وشهور)
2- poor conductors of heat. (تمنع فقدان الحرارة من الجسم)

② **Waxes** :-

Are Esters of long-chain of Monohydric (alcohol) with one long Chain of fatty acid.

خواصها :-

Solid at room temp. (صلب) كالشمع (long chain of fatty acid) كلما كان الـ

أنواع الشمع

Waxes have 3 type : ① - Cholesterol ester
② - Vitamin A (retanol)
③ - Ear waxes :- (Cerumen) : Yellows substance secreted in the human ear canal.

وظيفته
function :

a) provide some protection from bacterial, fungi insects and water.
b) Cleaning and lubricating the skin of the ear canal.

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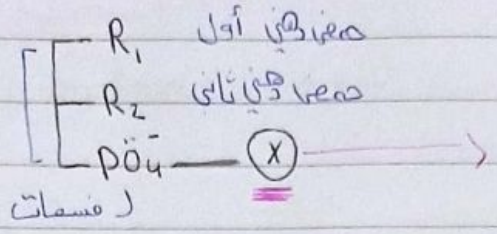
2- Compound lipids :-

↳ Are esters of fatty acids with alcohol in addition to other groups or compounds.



They are 3 types :- 1- phospholipid , 2-glycolipids, 3- lipoprotein.

I = **Phospholipid :-** are easters of fatty acids with alchdol in addition to phosphate group.

Note :- => phosphate group are **amphipathic lipids**

:- the (head) is phosphol , while the (tail) is nonpolar

(head) ↓↓ Phosphate Group

(tail) ↓↓ (R_1, R_2)

* Amphipathic lipids like (phospholipid) => Can form :- ↓↓

1. Micelle :- (spherical Shape of phospholipid)
2. lipid Bilayer :- (Basic Structure of biological membrane).
3. liposome :- (Spherical Shape of lipid bilayer)

Importance :- has role in absorption and digestion of lipids in small intestine.

Importance :- has role in pinocytosis and exocytosis (endocytosis).

* Phospholipids are classified into two main groups

1- Glycerophospholipid.

2- Sphingomyelins.

=> . Contain glycerol, and represent the most abundant phospholipid in the cell membrane.

=> They are divided into :-

① - phosphatidic acid (diacylglycerol phosphate):

=> Consist of glycerol with R_1, R_2, phosphate group, without addition.

Importance:- It is an intermediate in the synthesis of phospholipid.

مركب وسطي لتصنيع كل أنواع الـ phospholipid

② - phosphatidylcholine (lecithin)

=> Consist of glycerol with R_1, R_2, phosphate group, with choline.

يدخل في تلوين الغشاء

Importance:- ① Major component of cell membrane.

② treatment of fatty liver and atherosclerosis => علاج الكبد الدهني وتصلب الشرايين

③ Surfactant (reduce surface tension of water in lungs

④ prevent lung collapse. يمنع انهيار الرئة

Medical Importance:-

متلازمة ضيق التنفس

① Respiratory distress Syndrome:

The lungs of immature infants do not have enough type II epithelial cells, which lead to produce inadequate amount of lecithin which lead to (lung collapse)

* تصيب الطفل في الولادة المبكرة يعني مادة الـ lecithin للتنفس لا يعطي
لأنه إذا لم يوجد مادة الـ lecithin في الطفل يصل إلى انهيار في الرئة والموت

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Note { كل أنواع السكولاتة يوجد فيه الـ Lecithin لأنه يجعل السكوتة متجانس

2- Snake venom : سم الثعابين

Contain enzyme called phospholipase A2 that cleaves the fatty acid in the position 2 of a phospholipid in cell membrane of red blood cells that lead to hemolysis.

يحتوي على إنزيم يسمى phospholipase A2 يشق الحمض الدهني في فسفوليبيد في غشاء خلية من خلايا الدم الحمراء الذي يؤدي إلى انحلال الدم (تكسر الدم)

③- phosphatidyl ethanolamine (cephalin) (يتأثر على عوامل إتجاه وليس إصفائح)

=> Consist of phosphatidic acid and the phosphate group with ethanolamine.

→ Importance: activating factors of coagulation mechanism called [thromboplastin] factor III

④ Cardiolipin (diphosphatidylglycerol).

=> Consist of double phosphatidic acid connected with glycerols in the center.

→ it was first found in animal heart

→ double pöy, double R_1 & R_2, double glycerol. مكونات مهمة للغشاء الداخلي للميتوكوندريا

→ Importance:- ① important component of the inner mitochondrial membrane.

② diagnosis of syphilis, تشخيص مرض الزهري

⑤ phosphatidyl serine.

=> Consist of phosphatidic acid and phosphate group attached with amino acid serine

Importance:- it is found in the cell membrane.

ملاحظة: الوظيفة الأولى لأي phospholipid هي تكوين الغشاء الخلوي cell membrane.

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⑥ - Phosphatidylinositol (lipositol) :-

=> Consist of phosphatidic acid and phosphate group attached to (inositol)

الأهمية — توجد في غشاء الخلية

Importances:- ① found in the cell membrane.

② Second messenger called inositol triphosphate (الرسول الثاني للهرمونات)

↳ second messenger for hormone.

الرسول الأول: هرمونات، ...

⑦ - Plasmalogen :- = (يؤثر على الصفائح)

=> Structure similar to ethanol or lecithin but, it contains unsaturated alcohol attached to glycerol to carbon 1

=> it is present in cell membrane in the brain and muscles.

الأهمية

Importance:- It acts as platelet activating factor.

يعمل كعامل تنشيط للصفائح الدموية

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